TechnologyWatch

INNOVATIONS IN WARFARE

CACCTUS Takes Root

USMC Simulation Moves Staff Training From Sand Table to PC

By MICHAEL PECK

For 20 years, the U.S. Marine Corps staff has learned the art of fire support using a big terrain map whose miniature vehicles and cotton-ball explosions would have looked familiar to Gen. Dwight D. Eisenhower when he planned D-Day.

The Combined Arms Staff Trainer (CAST) does have ceiling-mounted lasers to project red and green dots onto the terrain, but they're controlled by DOS-based computer programs. Aircraft are simulated with a model on a stick.

But now the facility is getting a computer upgrade that will add 3-D representations of fires and effects, allow Marines to use the same kind of communications gear that they will take to the field, and train an entire Marine Air-Ground Task Force staff at one facility.

Called CACCTUS (Combined Arms Command and Control Trainer Upgrade System), the estimated $20 million system is scheduled to begin service in 2008 and reach full capability in 2011.

"CACCTUS takes CAST to the next level," said Maj. J.P. McDonough, who oversees modeling and simulation for Marine Training and Education Command, and serves as requirements officer for CACCTUS.

The first CACCTUS upgrade will take place at the Marine Corps Air Ground Combat Center at Twentynine Palms, Calif., with upgrades to follow at Camp Lejeune, N.C.; Camp Pendleton, Calif.; in Hawaii; and in Okinawa, Japan.

CACCTUS will improve training for fire support teams.

"The fire-support teams that sit around that big training board weren't getting any training out of it," McDonough said. "They were just providing input to the staff."

Three-dimensional visuals will allow them to practice calls for fire during battle while they help train the staffs. The graphics aren't videogame quality but look good enough to see an explosion or distinguish a tank.

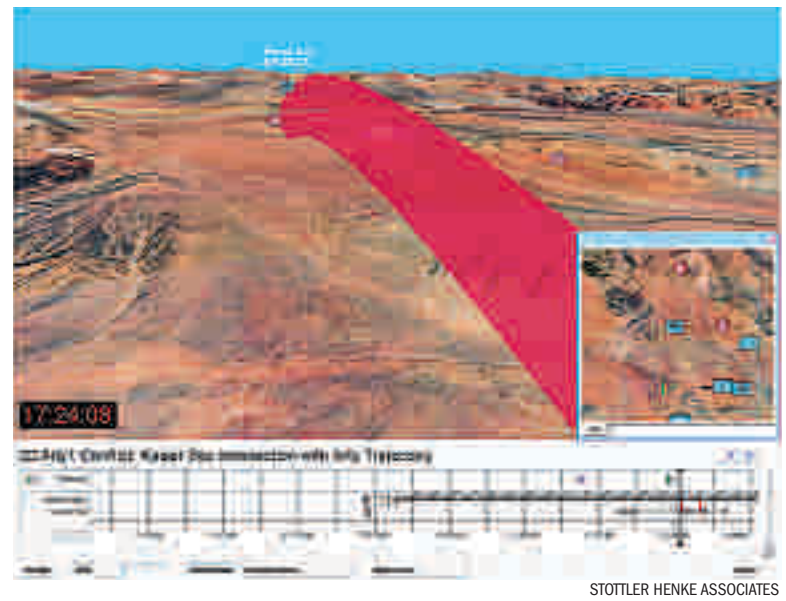
"They'll see bad guys and explosions," he said. "When they do a call for fire, they can see the impact and adjust it."

The visuals also will enable the Marines to conduct combined arms training in simulated urban terrain — a capability sorely needed in the Iraq war.

The new system also will allow Marines to train on battlefield systems, including the Command and Control Personal Computer, the Advanced Field Artillery Tactical Data System and Data Automated Communications Terminal.

"The Army and Marine Corps use C4I systems that are complicated and difficult to learn," McDonough said. "For all the Marine Corps, our goal is to have them, as much as possible, use the exact same systems they would use if they were out there operationally."

And instead of communicating over old-fashioned land lines, users will have a digital communications net that replicates their field gear. Staff inside a remote combat operations center can hook their radios into the Joint Training and Experimentation Network.



STOTTLER HENKE ASSOCIATES

Taking CAST to the Next Level: The After Action Intelligent Review System will record Combined Arms Command and Control Trainer Upgrade System training missions and allow instructors to preview and customize their debriefings.

"You can have one battalion sitting in the CAST doing planning, you can have another battalion that's live in the training area, and the regimental staff can also participate from another CAST facility," McDonough said.

CACCTUS also may enable CAST facilities to link to live exercises.

"You could have a staff operating out of a [Combat Operations Center] in Camp Lejeune, one of their battalions could be at the CAST facility at Camp Pendleton, and there could be a live battalion training at Twentynine Palms," McDonough said. "There would be a virtual and a live battalion, and they won't be able to tell the difference."

After-Action Review

Perhaps the biggest advantage of the CACCTUS upgrade is the after-action review (AAR) system, which is being developed by Stottler Henke Associates in San Mateo, Calif.

"With the benefit of switching to computer-based everything, the big bang for the buck is that we can have automated AAR," said Randy Jensen, Stottler Henke's program manager for the AAR segment of CACCTUS.

The system has three parts. One tracks the locations of units and supporting fires. The second tracks human input. The third part may be the most interesting — if it works as advertised. CACCTUS will contain a voice-recognition program that sifts through audio transcripts and locks onto key words. This will allow instructors to isolate specific communications for review.

"Not heavy-duty speech-recognition stuff," Jensen said. "Just looking for key content that reflects decision-making. Let's say there was a battlespace geometry conflict. We'll look for when was the call for fire, and when was it approved."

Those who have struggled with commercial speech-recognition software that gets every other word wrong may shake their heads.

Jensen admits this is a "pretty significant problem," but he reports that lab tests using the EdusSpeak software package have achieved 80 percent accuracy. As a backup, the system will also create a visual timeline of which station spoke when.

"At the end of an exercise, the instructors only have 30 minutes to put together a debrief, so it has to be fast," Jensen said. "They don't have to play back a bunch of [communications] and get a lot of false positives on the speech recognition. That's why we implemented this timeline stuff, because the speech recognition performance could be anywhere from zero to a high percentage."

CACCTUS will link the visual playback on large video screens to voice communications.

"Let's say we're talking a battlespace geometry conflict," Jensen said. "Maybe a close-air support mission with an altitude that would have put it through the trajectory of an active artillery mission. We're going to automatically play back the comms of the artillery mission that was approved, and we're going to automatically configure the playback to have a camera position where you can see a visual representation of the trajectory and the aircraft passing through it."

CACCTUS will also use intelligent tutoring. For example, a forward observer practicing call-for-fire could get automated feedback on adjusting fire or identifying hostile vehicles.

With typical Marine thriftiness, the Corps used the U.S. Army's OneSAF (One SemiAutomated Force) constructive simulation as the underlying engine for CACCTUS. OneSAF, rolled out last October, is designed to replace numerous semi-automated force simulations across the military.

The Marines designed Marine-specific entities for OneSAF's database, and McDonough cautioned that the version the Marines would use would be more basic than the Army version.

"The focus is on combined arms staff planning. We don't need to have 10,000 entities," McDonough said.

Despite all the gadgetry, the old-fashioned terrain board will remain.

"The funny thing is that the terrain board isn't going away," he said. "The visualization you get from it is still helpful, even if you have a computer." ■

TECH BRIEFS

Fake Images To Fool Sensors

Spanish systems specialist Indra is marketing a laser-based directed infrared countermeasures (DIRCM) system, Manta, aimed at operators of transport planes such as the C-130J and planned A400M, tankers and VIP aircraft.

The Manta anti-missile system uses fake imagery plus the conventional saturation method, Indra technician Jaime Temes said.

First-generation countermeasure systems rely on saturating the missile seeker with a laser beam. But the latest generation of anti-aircraft missiles are programmed to retain a memory of the last known heading of the target aircraft to defeat the saturation effect. Manta seeks to counter this by sending a false image down its laser beam that the missile would follow away from the aircraft.

Testing Smarter Rotors

Boeing announced it will test a main rotor system that promises quieter operation, reduced vibration and potentially improved performance for military helicopters like the AH-64D Apache Longbow.

Under a $3 million Defense Advanced Research Projects Agency contract, Boeing will test the Smart Rotor for the next year at NASA Ames Research Center's wind tunnel in California to study the system's forward flight characteristics and gather data to validate state-of-the-art aero-acoustic analysis codes. The codes are used to predict data that help identify the cause of rotor noise, allowing engineers to study and compare alternate designs.

The system includes trailing edge blade flaps controlled by on-blade piezo electric actuators and control electronics that optimize flap motions.

Unique Bearing Test Rig

High-speed turbine experts at the U.S. Air Force Research Laboratory's Propulsion Directorate developed a one-of-a-kind test facility to demonstrate the Revolutionary Approach to Time-Critical Long-Range Strike (RATTLRS) forward-thrust bearing technology, a high-Mach air vehicle program funded by the Office of Naval Research.

The new facility can evaluate the RATTLRS forward-thrust bearing from initial concept to flight mission testing. It can achieve engine bearing compartment airflow, temperature and pressure conditions needed to simulate vapor delivery and "cooling" air as separate, controllable air circuits. ■

Compiled by **Michele Savage**.